32-BIT MICROCONTROLLER

MB9AA30N SERIES

BLUEMOON-EVB HARDWARE

USER MANUAL

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FUJITSU

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This manual contains 32 pages.

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Contents

REVISION HISTORY **2**

CONTENTS **3**

1 INTRODUCTION **5**

1.1 Purpose 5

1.2 Definitions, Acronyms and Abbreviations 5

1.3 Document Overview 5

2 OVERVIEW AND FEATURES **6**

2.1 Overview 6

2.2 Features 6

3 SYSTEM BLOCK AND CONNECTION **7**

3.1 System Block 7

3.2 System Connection 8

3.2.1 Connectors on Main Board 8

3.2.2 EVB runs normal Connection 9

3.2.3 Connection on serial programmer 10

3.2.4 Connection on JTAG 11

4 PROGRAM DOWNLOAD **12**

4.1 Serial programming 12

4.2 JTAG Debug 14

5 EACH MODULE DESCRIPTION **17**

5.1 Main Interfaces Overview 17

5.2 Power Supply 21

5.3 LCD Display and control 22

5.4 Temperature Sample 23

5.5 RTC calibration 24

6 EACH FUNCTION OPERATION **25**

6.1 Operation Overview 25

6.2 EV Board Start-up 26

6.2.1 Start-up Display 26

6.2.2 RTC Default Setting 26

6.3 Normal Mode Operation 27

6.4 Test Mode Operation 28

6.5 Low Power Consumption Mode Operation 29

7 TROUBLE SHOOT 30

8 ADDITIONAL INFORMATION 31

9 APPENDIX 32

9.1 List of Figures and Tables 32

1 Introduction

1.1 Purpose

This user manual describes hardware structure of Bluemoon EVB and functions of each module.

This user manual describes hardware system block, each function definition, list operation steps and trouble shoot.

1.2 Definitions, Acronyms and Abbreviations

1.3 Document Overview

The rest of document is organized as the following:

Chapter *2* explains *Overview and Features*

Chapter *3* explains *System Block and Connection.*

Chapter *4* explains *Program Download*.

Chapter *5* describes *Each Module Description*.

Chapter *6* describes *Each Function Operation*.

Chapter *7* explains *Trouble Shoot*.

2 Overview and Features

Overview and Features of System

2.1 Overview

This Bluemoon EV Board is intended to aid the user in the rapid evaluation and development of segment LCD and RTC control using MB9AA30N series MCU which are embedded with ARM Cotex-M3 core. This EV Board targets to control LCD, RTC, low power consumption mode and so on modules.

The EV Board has 8COM LCD with 17 available segments, which is able to display abundant contents. FUJITSU's MB9AA30N series MCU integrated 8COM segment LCD driver circuit and RTC circuit etc., user is capable of operating them easily. Furthermore, TSC keys also are provide, The TSC_LIB.a gave the driver and signal processing functions. Otherwise, user can use the EVB to evaluate MCU power consumption. Figure 3-1 provides a photograph of the Bluemoon EV Board. A block diagram that shows the main components of the system is provided.

All the system features have been listed in section *2.2Features*.

2.2 Features

- Support RTC display and setting
- Support low-power consumption setting and return
- Support 8-COM Segment LCD
- Support JTAG and UART programmer
- Support TSC keys use GPIO Algorithm
- Support USB 5V/DC power supply
- Support Battery power supply(1.5V/AAA X 4)
- User LED control
- User Key and joystick control

3 System Block and Connection

Block and Connection of System

3.1 System Block

This EV board includes: one 8COM segment LCD and it's backlight circuit, a TSC key, two mechanical keys, a joystick key, two LEDs, a serial port and JTAG interface. The power supply is selectable between DC 9V, USB and battery.

Figure 3-1 shows the system block diagram.

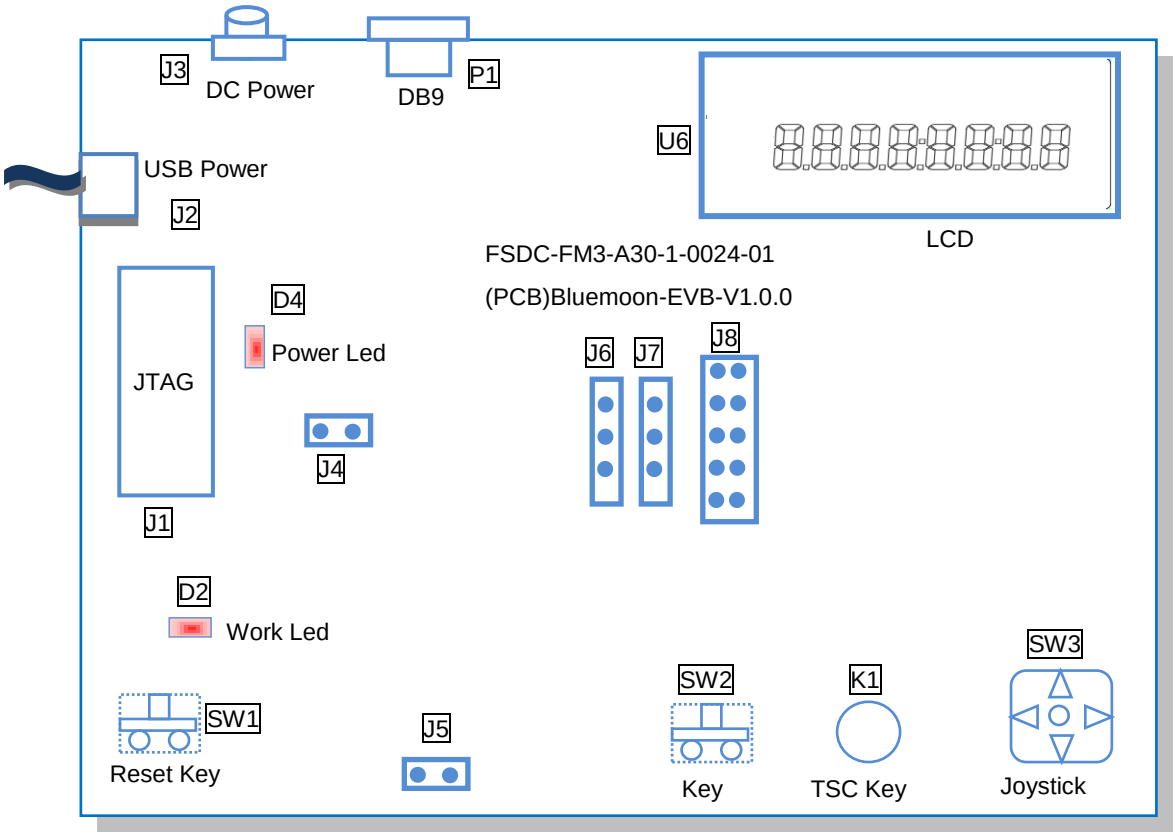

Figure 3-1: System Block Diagram

3.2 System Connection

3.2.1 Connectors on Main Board

The connectors on Main Board are shown in Figure 3-2

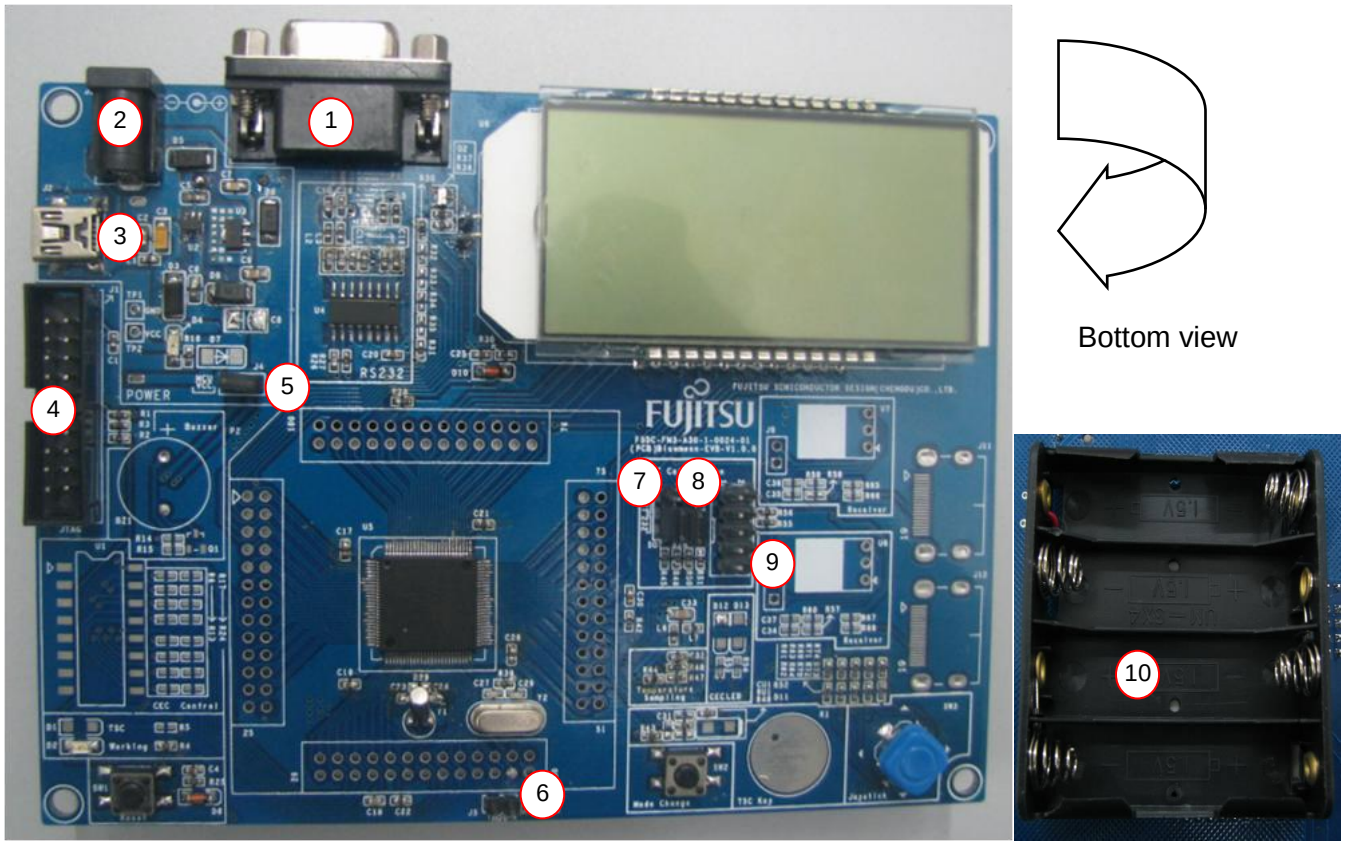

Figure 3-2: Connectors on Main Board

Table 3-1collects the definition of the connectors on main board.

Table 3-1: Definition of Connectors on Main Board

Number	Port Designator	Description	Remarks
1	P1	serial port	N/A
2	J3	DC power supply (9V)	N/A
3	J2	USB DC 5V power supply	N/A
4	J1	JTAG interface	N/A
5	J4	Jumper, MCU Power selector	N/A
6	J5	Jumper, serial programming selector(MCU mode pin)	N/A
7	J6	Jumper, serial programming selector(UART Txd)	N/A
8	J7	Jumper, serial programming selector(UART Rxd)	N/A
9	J8	RTC calibration port	N/A
10	BT2	Battery power supply	N/A

3.2.2 EVB runs normal Connection

The normal operation of EV board connection as Figure 3-3 shows

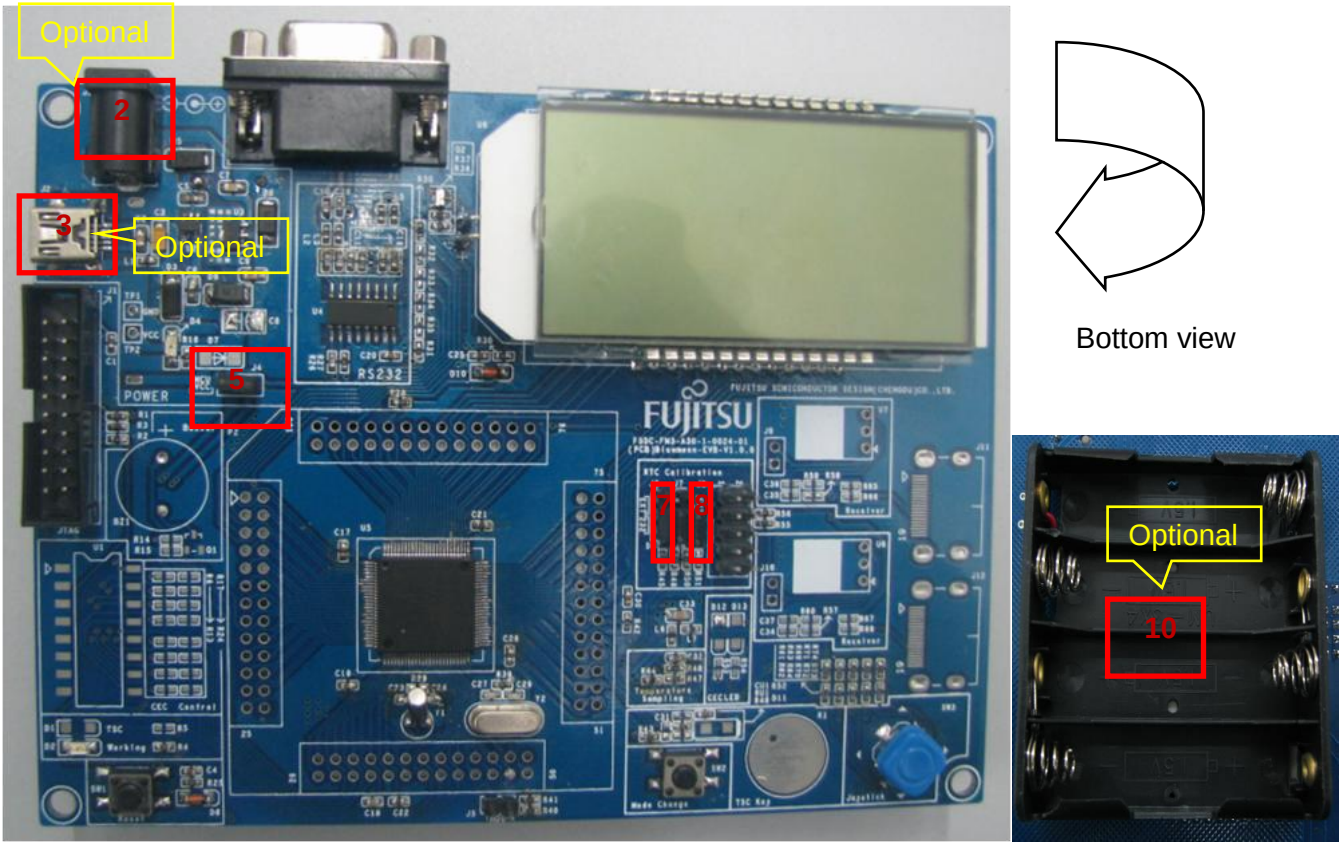

Figure 3-3: Connection on Normal Operation

Table 3-2 collects the definition of connection on normal operation

Table 3-2: Definition of Connectors on Normal Operation

Number	Port Designator	Description	Remarks
2	J3	DC power supply (9V)	optional
3	J2	USB DC 5V power supply	optional
5	J4	Jumper, MCU Power selector	N/A
7	J6	Jumper, serial programming selector(Txd, strobe 2,3 pin)	N/A
8	J7	Jumper, serial programming selector(Rxd, strobe 2,3 pin)	N/A
10	BT2	Battery power supply	optional

Note: Don't strobe J5.

3.2.3 Connection on serial programmer

The EV board download file used serial programmer connection as Figure 3-4 shows

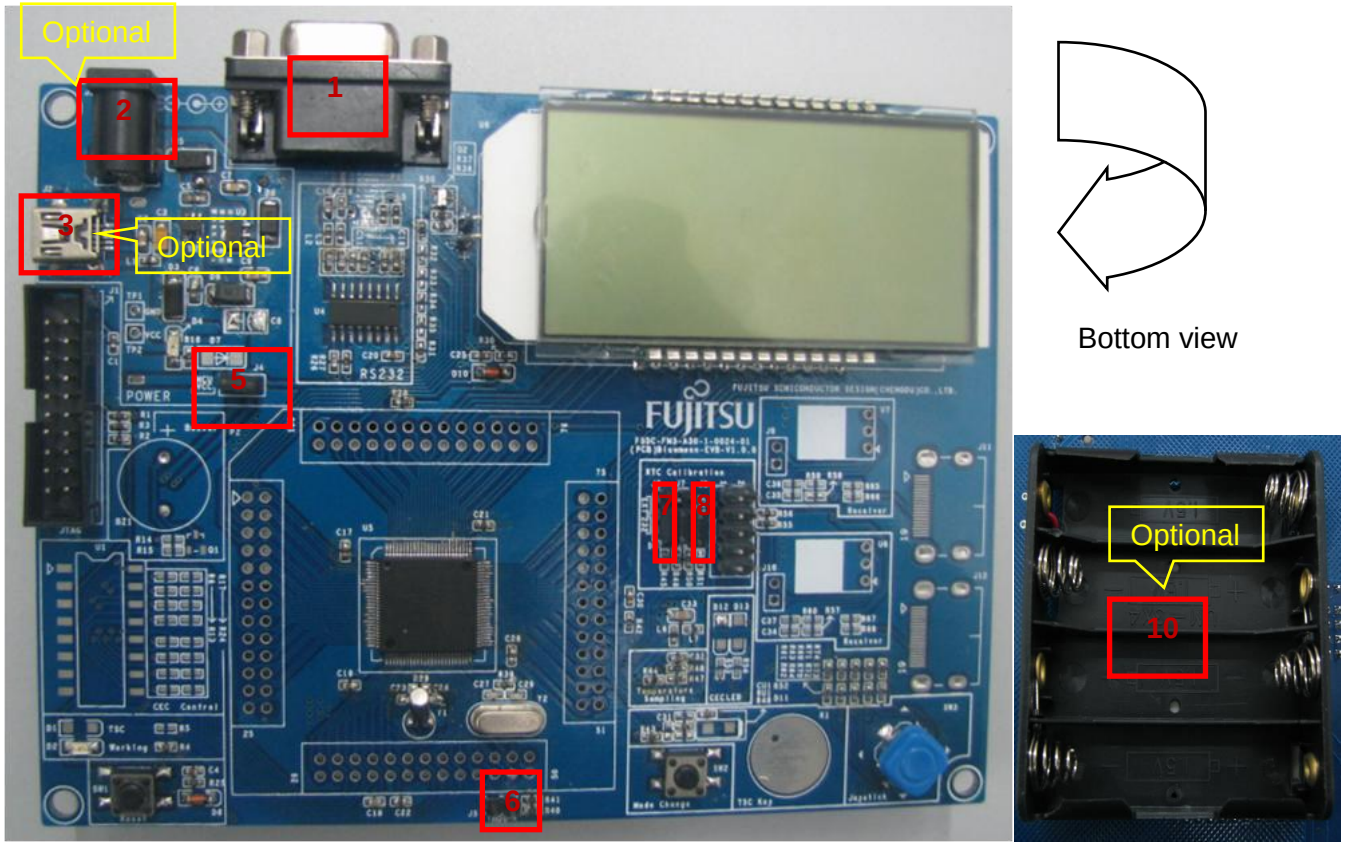

Figure 3-4: Connection on Serial Programmer

Table 3-3 collects the definition of connection on serial programmer

Table 3-3: Definition of Connectors on serial programmer

Number	Port Designator	Description	Remarks
1	P1	Serial port	N/A
2	J3	DC power supply (9V)	optional
3	J2	USB DC 5V power supply	optional
5	J4	Jumper, MCU Power selector	N/A
6	J5	Jumper, serial programming selector(MCU mode pin)	N/A
7	J6	Jumper, serial programming selector(Txd, strobe 2,3 pin)	N/A
8	J7	Jumper, serial programming selector(Rxd, strobe 2,3 pin)	N/A
10	BT2	Battery power supply	optional

3.2.4 Connection on JTAG

The EV board download file used JTAG connection as Figure 3-5 shows

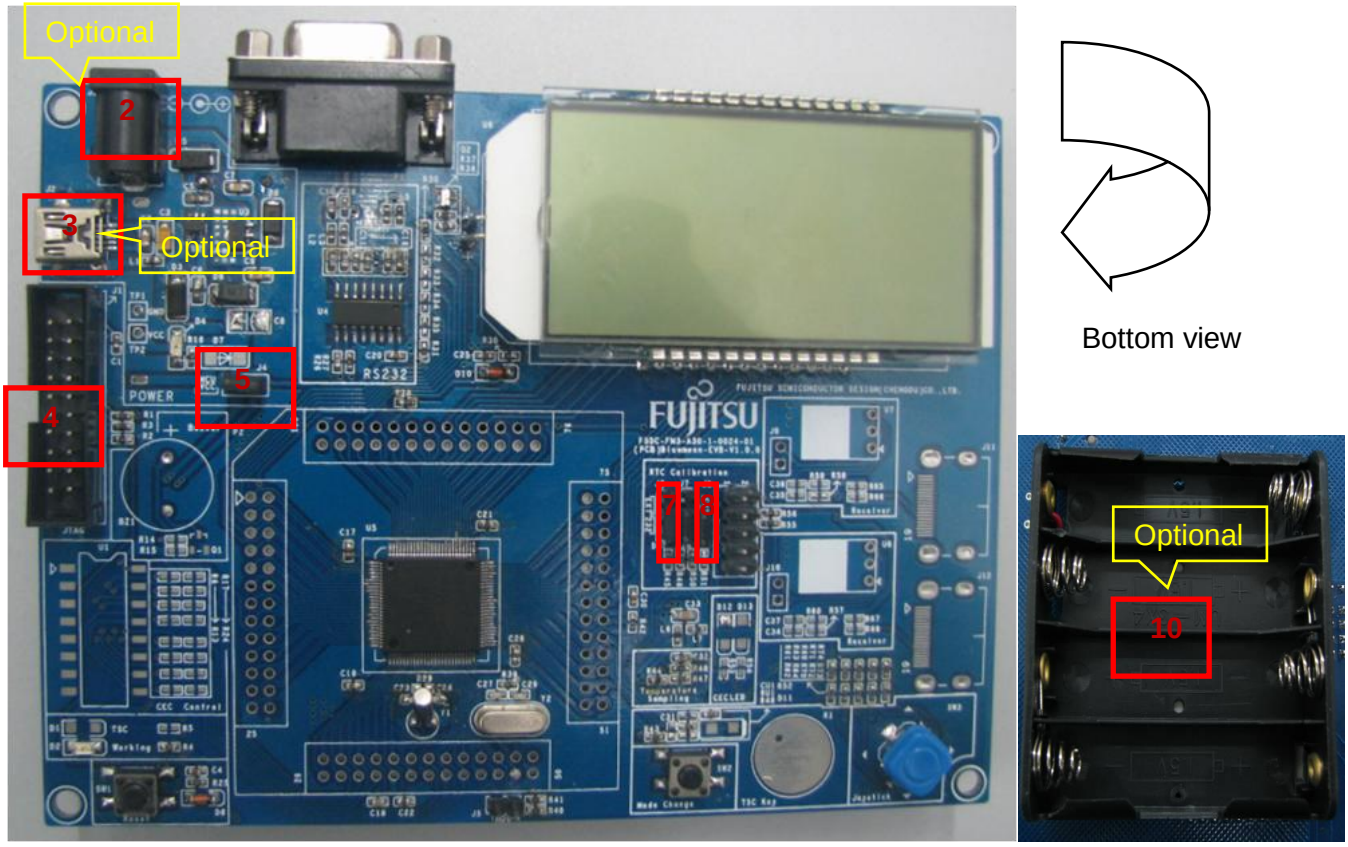

Figure 3-5: Connection on JTAG

Table 3-4 collects the definition of connection on JTAG

Table 3-4: Definition of Connectors on JTAG

Number	Port Designator	Description	Remarks
2	J3	DC power supply (9V)	optional
3	J2	USB DC 5V power supply	optional
4	J1	JTAG interface	N/A
5	J4	Jumper, MCU Power selector	N/A
7	J6	Jumper, serial programming selector(Txd, strobe 2,3 pin)	N/A
8	J7	Jumper, serial programming selector(Rxd, strobe 2,3 pin)	N/A
10	BT2	Battery power supply	optional

Note: First power on, then connect J-Link to PC and EV board.

Don't strobe J5.

4 Program Download

Program Download

This EV board can download the firmware used serial program and JTAG.

4.1 Serial programming

The demo board could download the firmware used FUJITSU SEMICONDUCTOR MCU Programmer.

1. Connect the board as *chapter 3.2.3 (Connection on serial programmer)*.
2. Open the software PCWFM3-V01L04/flash.exe
3. As Figure 4-1 shows, select the target MCU “MB9AF32L/M/N”, the crystal frequency “4M”, click the “Open” to select download file, then click the “Full Operation (D+E+B+P).

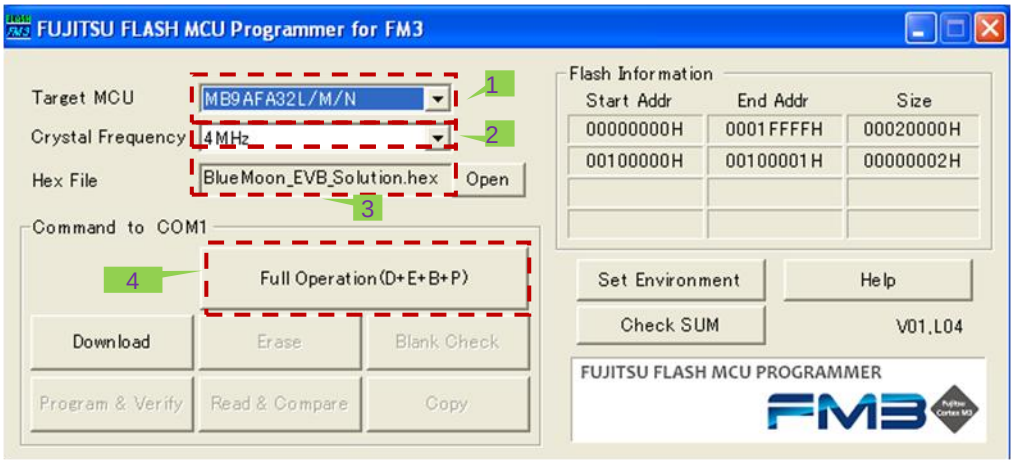

Figure 4-1: MCU Programmer

4. As Figure 4-2 shows, press the SW1 (MCU reset key) and click the “OK” quickly.

Figure 4-2: Connect System

5. Wait for some time, As Figure 4-3 shows the download file completely. Then do not strobe J5, the EVB will run normal.

Figure 4-3: MCU Programmer Download

4.2 JTAG Debug

The demo board supports standard 20-pin JTAG debugging and programming .The user is recommend using IAR system tools including the emulator and complier. The steps as:

1. Connect the board as *chapter 3.2.4 (Connection on JTAG)*.
2. As the Figure 4-3 shows, the J-Link led will turn green, EVB D4 (power supply indication) will light.

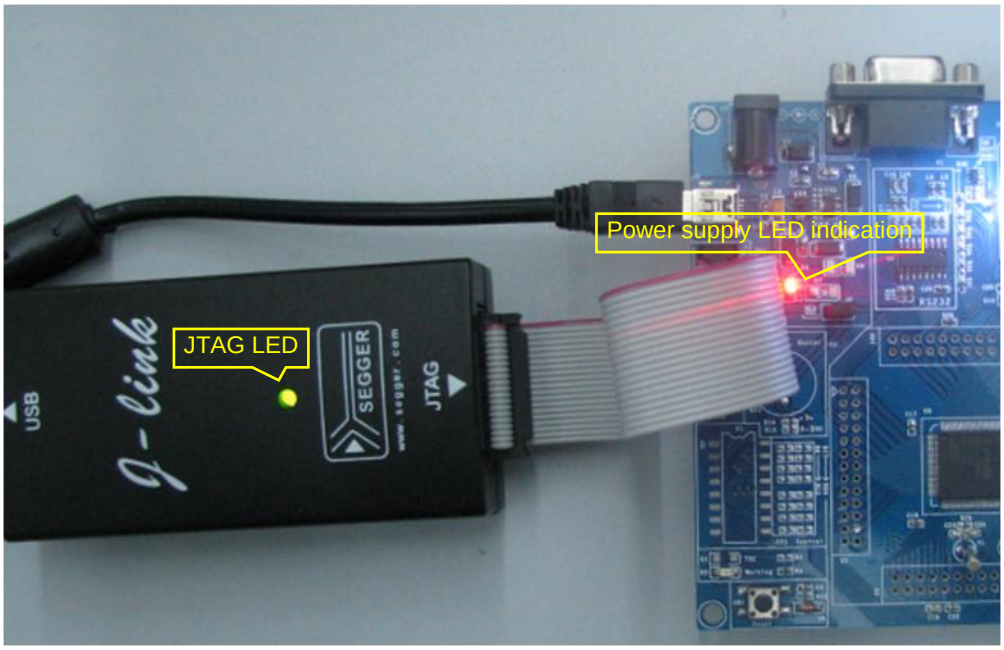

Figure 4-4: JTAG and EVB Connect

3. Open the project file, as Figure 4-5 shows

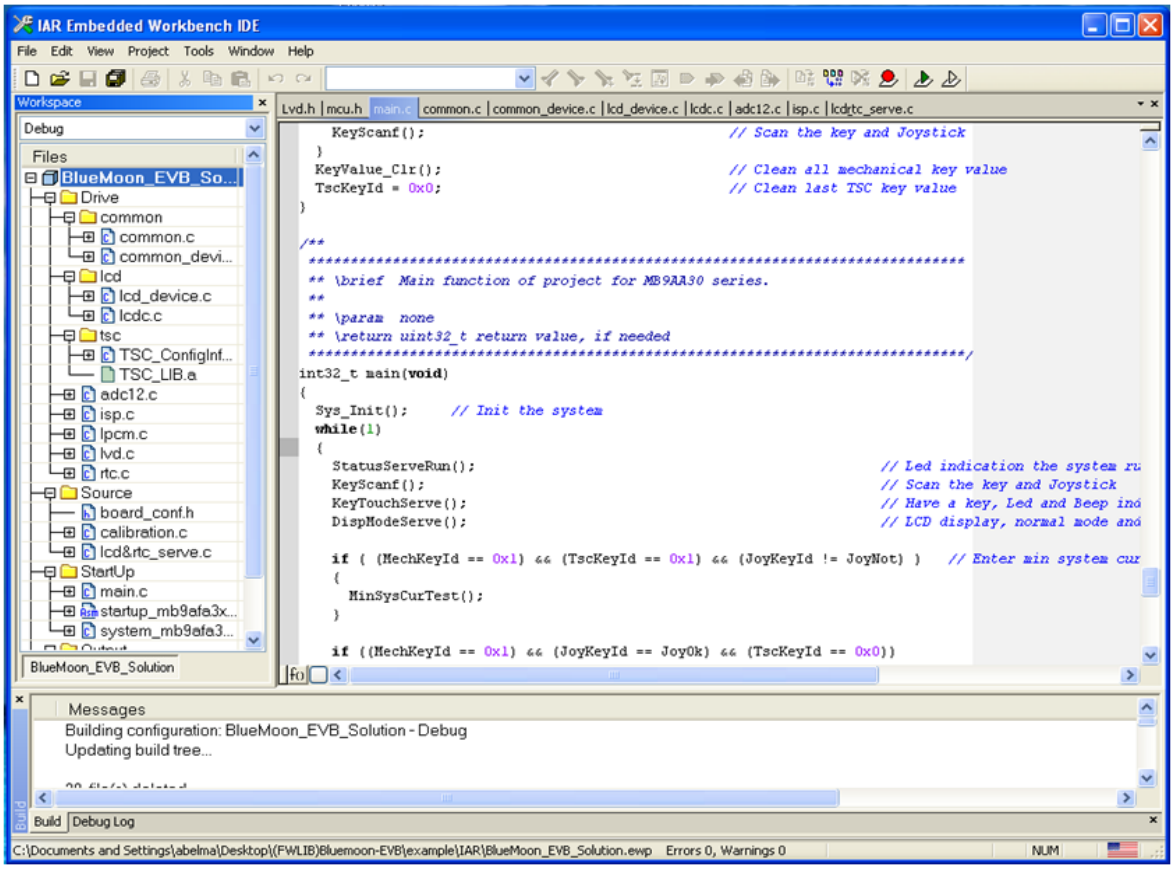

Figure 4-5: View of Project

4. Clicking **right button** on the project name, and select **"Rebuild All"**. The project will be rebuilt, as Figure 4-6 shows

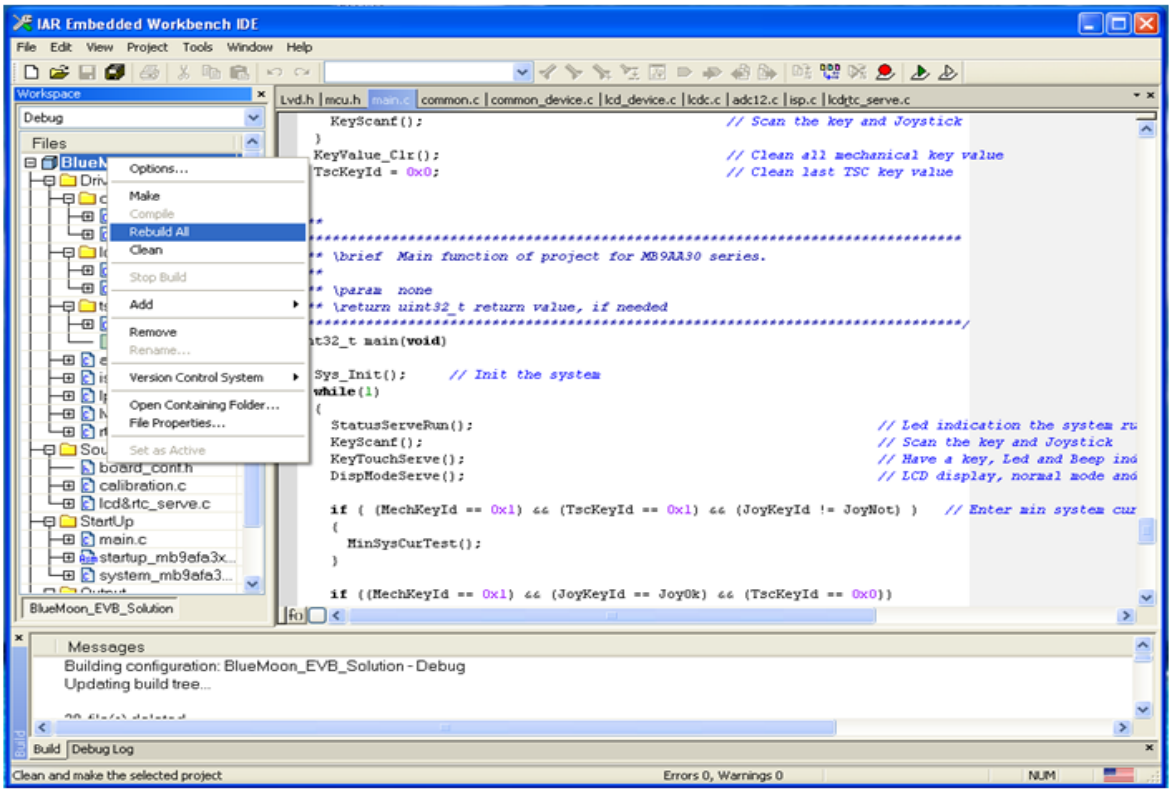

Figure 4-6: Rebuild the Project

5. If build no error, Select **“Project->Download and Debug”**

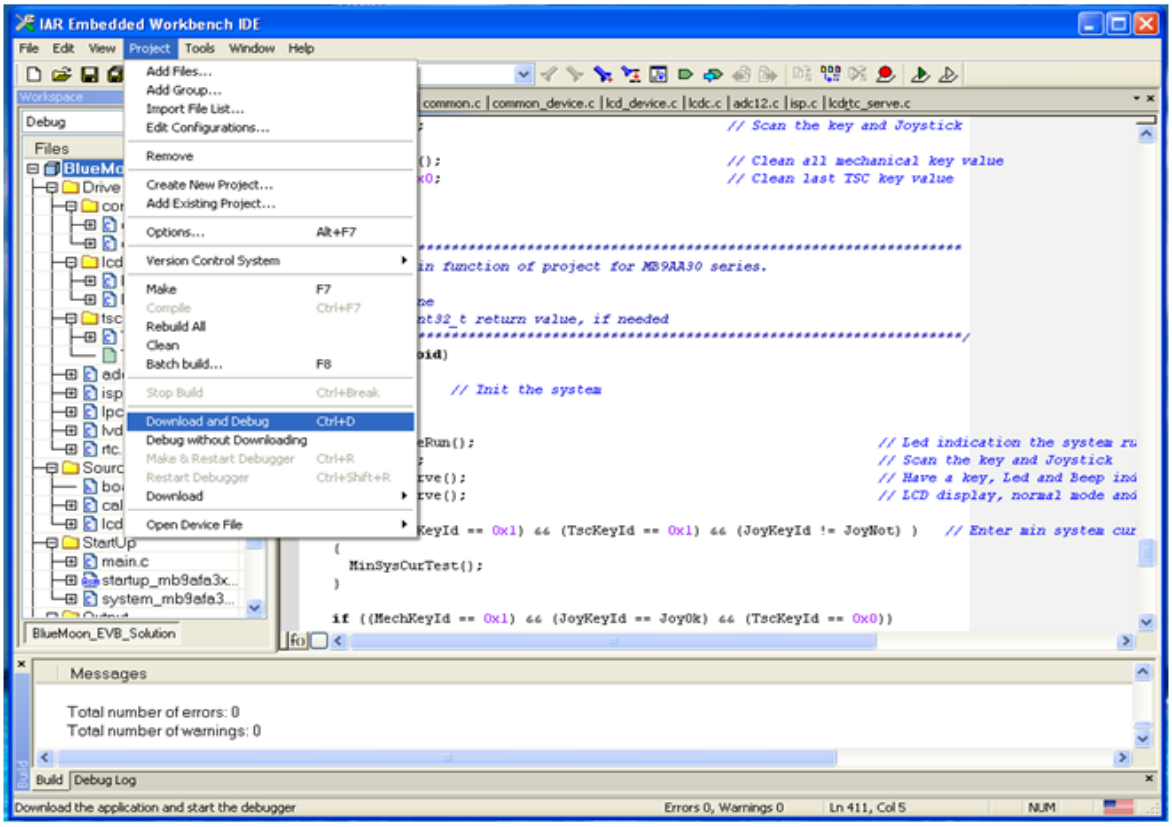

Figure 4-7: Download and Debug

6. As Figure 4-8 shows, the download file completely.

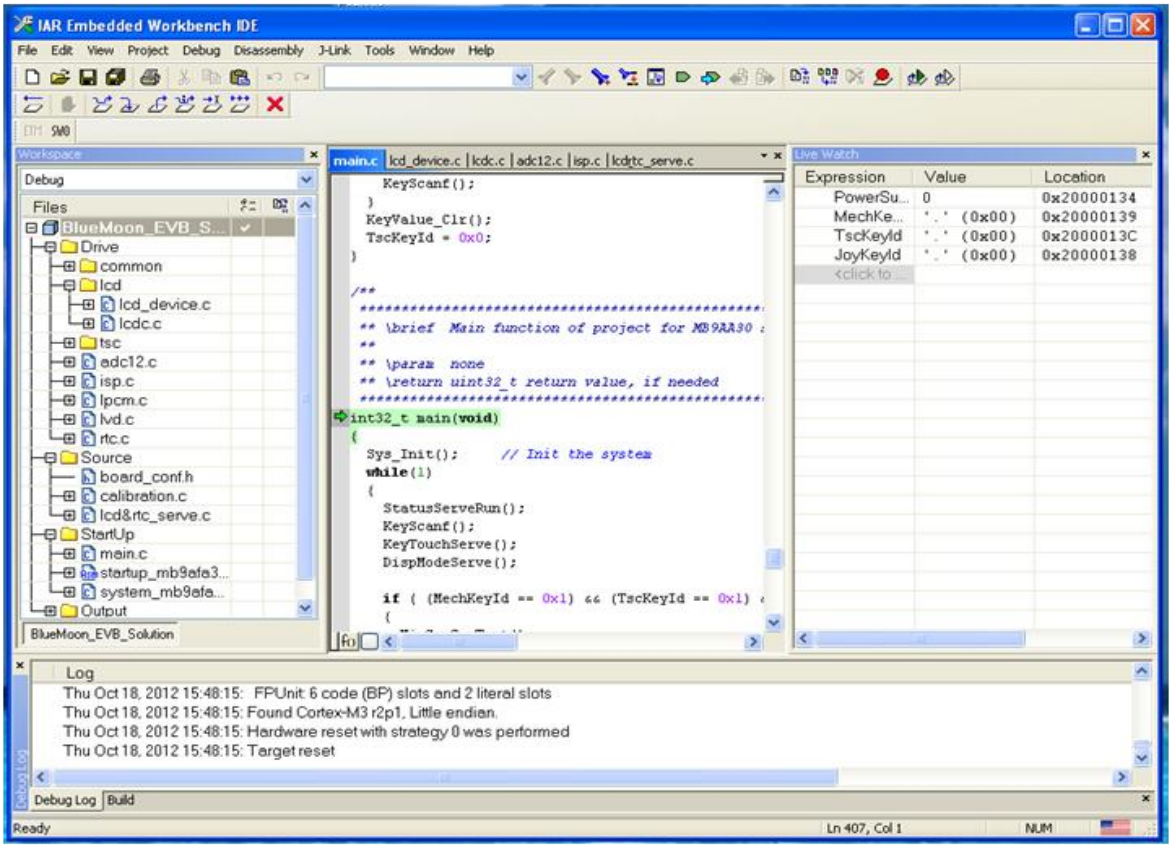
IAR Embedded Workbench IDE
File Edit View Project Debug Disassembly J-Link Tools Window Help
Log
Thu Oct 18, 2012 15:48:15: FPUnit: 6 code (BP) slots and 2 literal slots
Thu Oct 18, 2012 15:48:15: Found Cortex-M3 r2p1, Little endian.
Thu Oct 18, 2012 15:48:15: Hardware reset with strategy 0 was performed
Thu Oct 18, 2012 15:48:15: Target reset
Debug Log
Build
Ready
Ln 407, Col 1
NUM

Figure 4-8: Download completely

5 Each Module Description

Introduce Each Module

5.1 Main Interfaces Overview

The EV board main interfaces, example as connector, display and keys. As Figure 5-1 shows

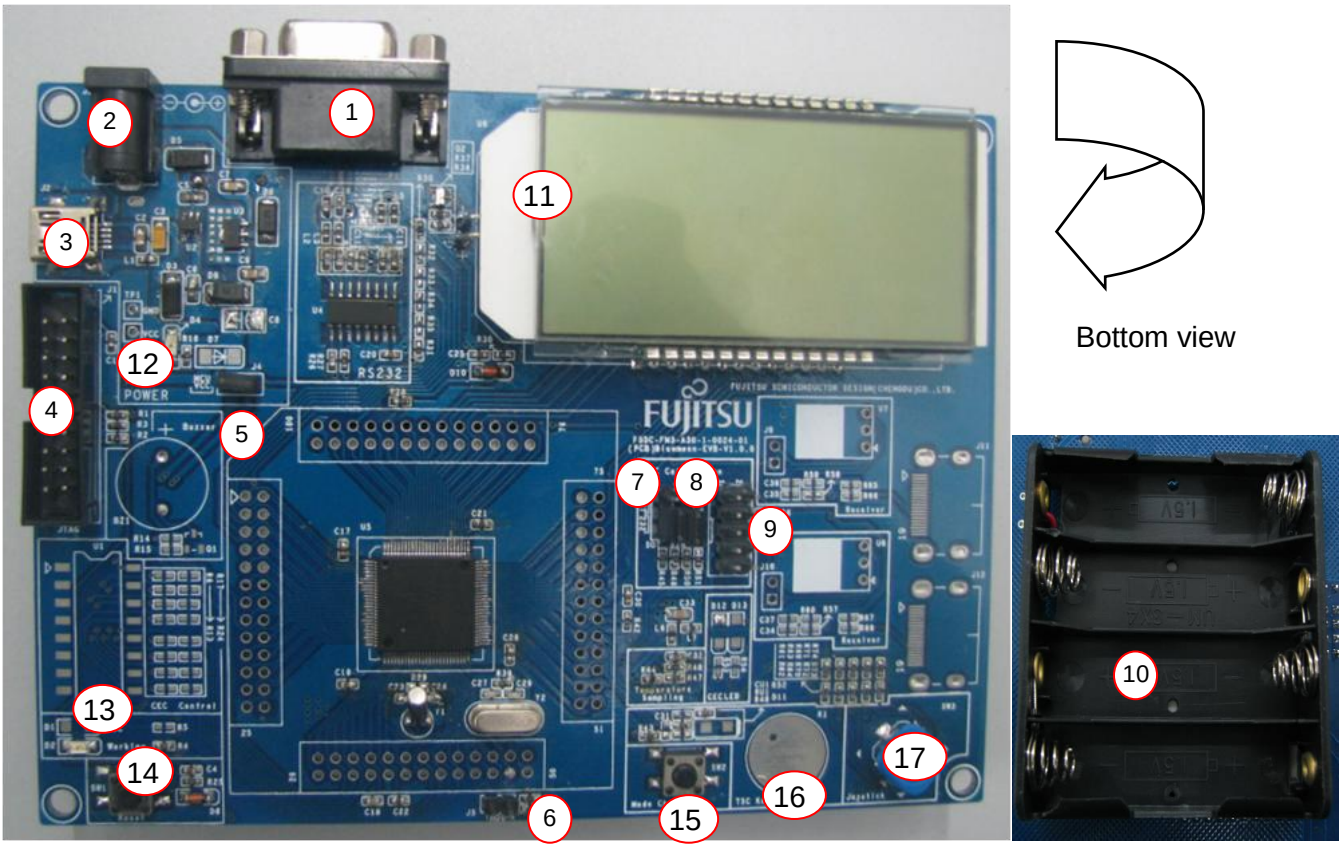

Figure 5-1: Connectors on Board

Table 5-1 collects the definition of the interfaces on Board.

Table 5-1: Definition of interfaces on Board

Number	Port Designator	Description	Remarks
1	P1	serial port	N/A
2	J3	DC power supply (9V)	N/A
3	J2	USB DC 5V power supply	N/A
4	J1	JTAG interface	N/A
5	J4	Jumper, MCU Power selector. User can measure MCU current used it	N/A
6	J5	Jumper,serial programming selector(MCU mode pin). Do not strobe J5 in any mode, except serial programming mode	N/A
7	J6	Jumper, serial programming selector(Txd, strobe 2,3 pin)	N/A
8	J7	Jumper, serial programming selector(Rxd, strobe 2,3 pin)	N/A
9	J8	RTC calibration port	N/A
10	BT2	Battery power supply	N/A
11	U6	LCD	N/A
12	D4	Power supply LED indication	N/A
13	D2	MCU work LED indication	N/A
14	SW1	Mechanical key, used MCU reset	N/A
15	SW2	Mechanical key	N/A
16	K1	TSC key	N/A
17	SW3	Joystick	N/A

Table 5-2 collects the definition of P1.

Table 5-2: Definition of P1

Pin	Description	Remarks
1	NC	N/A
2	Txd, EVB send data	N/A
3	Rxd, EVB receive data	N/A
4	NC	N/A
5	GND	N/A
6	NC	N/A
7	NC	N/A
8	NC	N/A
9	NC	N/A

Table 5-3 collects the definition of J1.

Table 5-3: Definition of J1

Pin	Description	Remarks
1	VCC	N/A
2	VCC	N/A
3	TRSTX	N/A
4	GND	N/A
5	TDI	N/A
6	GND	N/A
7	TMS	N/A
8	GND	N/A
9	TCK	N/A
10	GND	N/A
11	Pull-down to GND	N/A
12	GND	N/A
13	TDO	N/A
14	GND	N/A
15	nRST	N/A
16	GND	N/A
17	NC	N/A
18	GND	N/A
19	NC	N/A
20	GND	N/A

Table 5-4 collects the definition of J6.

Table 5-4: Definition of J6

Pin	Description	Remarks
1	SOT0_0_EXT	Connect to J8
2	SOT0_0	MCU serial
3	SOT0_0_232	RS232, Connect to U4

Table 5-5 collects the definition of J7.

Table 5-5: Definition of J7

Pin	Description	Remarks
1	SIN0_0_EXT	Connect to J8
2	SIN0_0	MCU serial
3	SIN0_0_232	RS232, Connect to U4

Table 5-6 collects the definition of J8.

Table 5-6: Definition of J8

Pin	Description	Remarks
1	RTCCO_1	N/A
2	NC	N/A
3	SOT0_0_EXT	N/A
4	SIN0_0_EXT	N/A
5	MD0	MCU mode pin
6	nRST	N/A
7	GND	N/A
8	VCC	N/A
9	NC	N/A
10	NC	N/A

5.2 Power Supply

EV board power supply has three methods, As Figure 5-2 shows

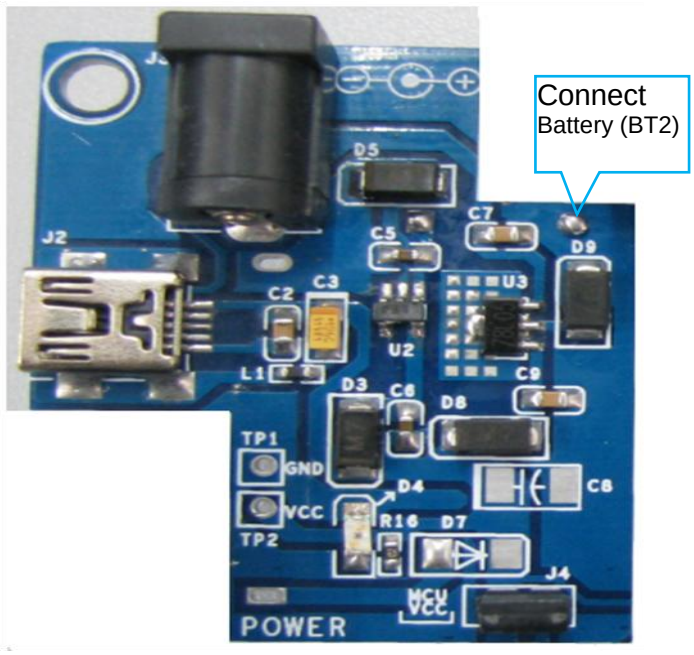

Figure 5-2: Power Supply

- DC power supply

  Use 9V DC power adapter which is positive inside and negative outside, the EV board works in 5V condition.

- USB power supply

  Use the USB power supply, the EV board works in 5V condition.

- Battery power supply

  Use battery power supply, the EV board works in 3.3V condition.

Allows the three method work together, the priority is DC 9V power supply > USB power supply > Battery power supply.

5.3 LCD Display and control

Figure 5-3 shows the LCD backlight and LCD drive circuit.

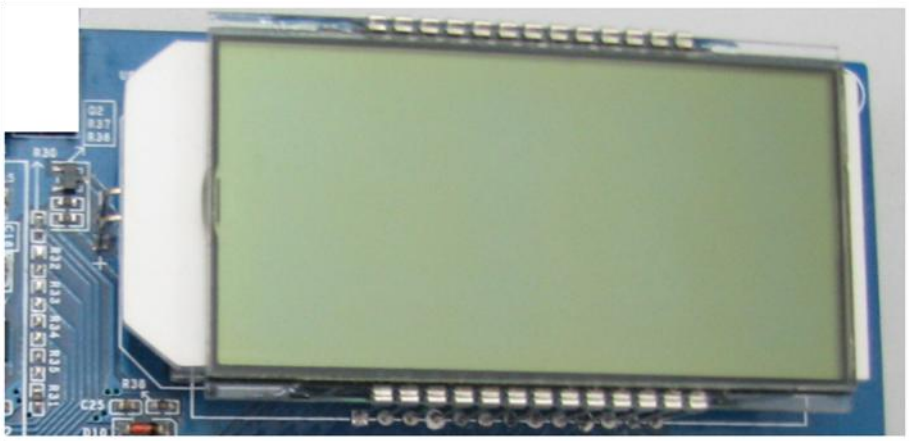

Figure 5-3: LCD Circuit

- LCD driver used internal divider resistor.
- When 5V power, used 10K internal resistor.
- When 3.3V power, used 100K internal resistor. So the backlight and LCD display will become dark.

5.4 Temperature Sample

As Figure 5-4 shows the temperature sample circuit.

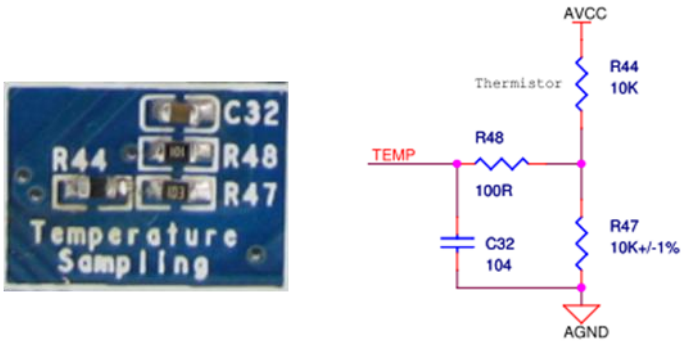

Figure 5-4: temperature sample

- ADC sample thermistor voltage to enhance RTC precision.
- When EV board is works, the AVCC always exist voltage. So in low consumption power mode, it will have some additional current consumption.
- The solution is R44 voltage can’t supply from MCUVCC.

5.5 RTC calibration

As Figure 5-5 shows RTC calibration circuit.

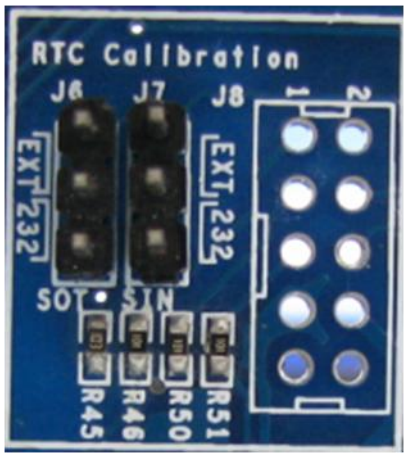

Figure 5-5: RTC calibration

- RTC calibration need used FUJITSU RTC Calibration tools.
- It used calibrate RTC crystal frequency deviation.

6 Each Function Operation

Each Function Operation

6.1 Operation Overview

The EV Board power on, D4 will light always, anytime press SW1 the EV Board will reset.

The system includes three modes.

- **Normal mode: system runs normal.**
- **Test mode**: convenient for measure the MCU power consumption; closed ADC, LVD, LCD and so on function.
- **Low power consumption mode**: used measure the MCU power consumption in standby RTC mode.

6.2 EV Board Start-up

After system board start-up, it runs normal mode. Enter test mode or low power consumption mode only from normal mode.

6.2.1 Start-up Display

The system power on, D4 will away light, D2 light last 2s, LCD display “FUJITSU” last 3s, As Figure 6-1 shows.

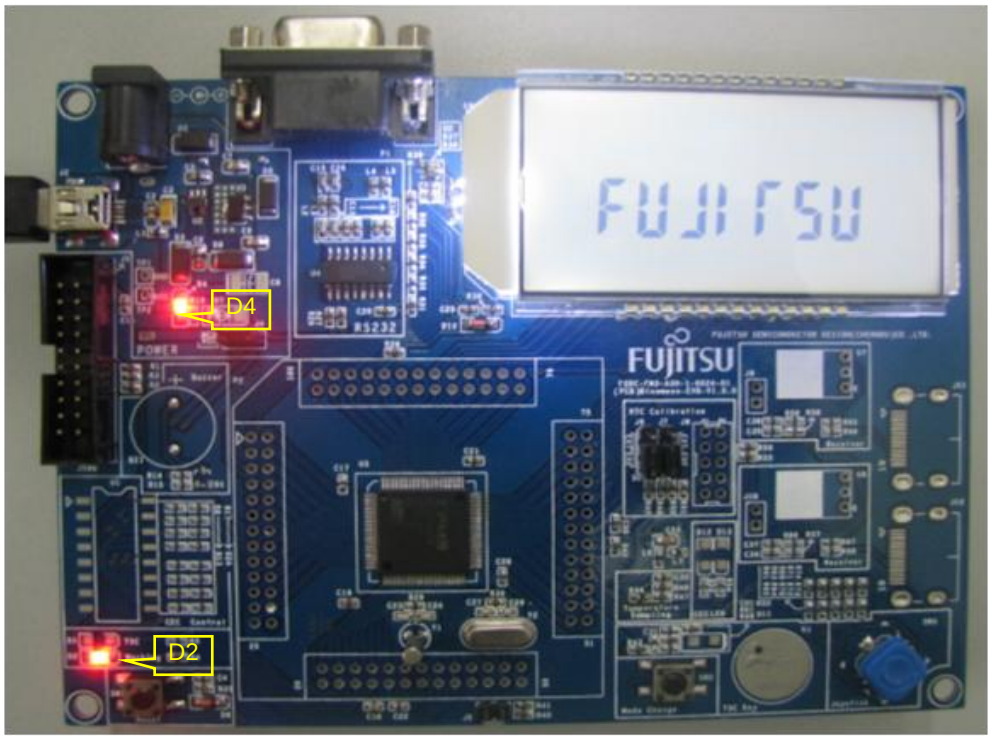

Figure 6-1: Start-up Display

6.2.2 RTC Default Setting

The system start-up from power shut, the RTC is set “2012-10-01” & “09:00:00”.

Figure 6-2: Display Time

Note: system reset, the RTC will save the current value.

6.3 Normal Mode Operation

1. LCD will display the current time without any operation, as Figure 6-2 shows.
2. Touch K1 or SW3, D2 light lasts 0.5 s, LCD displays current date and will lasts 5s then return to display the current time, As Figure 6-3 shows.

Figure 6-3: Display Date

3. Press SW2 + SW3 simultaneous, the system will enter RTC setting function.
   - ✓ The LCD blink place means current setting options, first is year setting option.
   - ✓ Press SW2 jumps to next option, includes year, month, day, hour, minute, second.
   - ✓ Press the SW3 (include up, down, left, right keys) to set the value. Up and left key will reduce current value, down and right key will add current value.
   - ✓ Press K1, exit RTC setting function without save any setting.
   - ✓ Press SW2 + SW3, save the setting and exit RTC setting function.

Note: Must be sure the setting is accurate, otherwise the EV board can't return RTC Setting function and jumps the error setting option.

6.4 Test Mode Operation

In test mode, the LCD and MCU main function is closed. As Figure 6-4 shows

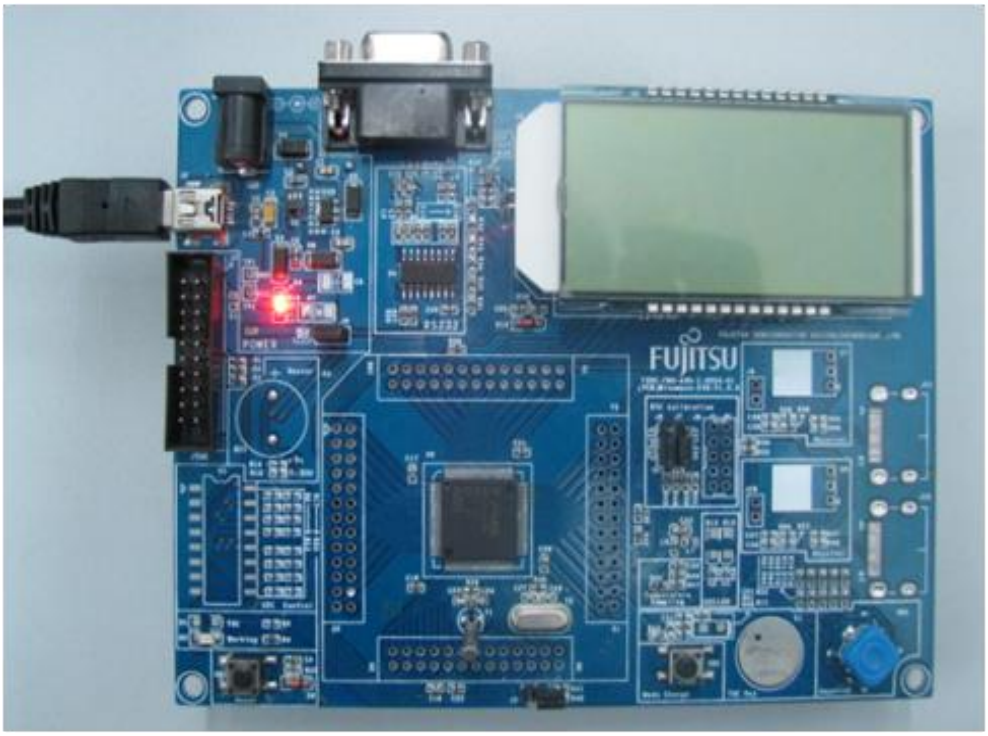

Figure 6-4: Test Mode Display

1. In normal mode, press SW2 + K1 + SW3 to enter test mode.
2. Press SW3, the D2 will light last 0.5 s.
3. In test mode, press SW2 + K1 + SW3 to exit normal mode.
4. In test mode, press SW2 + K1 will enter low power consumption mode. Press SW2 wake up it and then enter test mode again.
5. Note: If don't exit test mode, user should be sure not enter low power consumption mode.

6.5 Low Power Consumption Mode Operation

In low power consumption mode (standby RTC mode), MCU stop, but D4 is light always. As Figure 6-5 shows

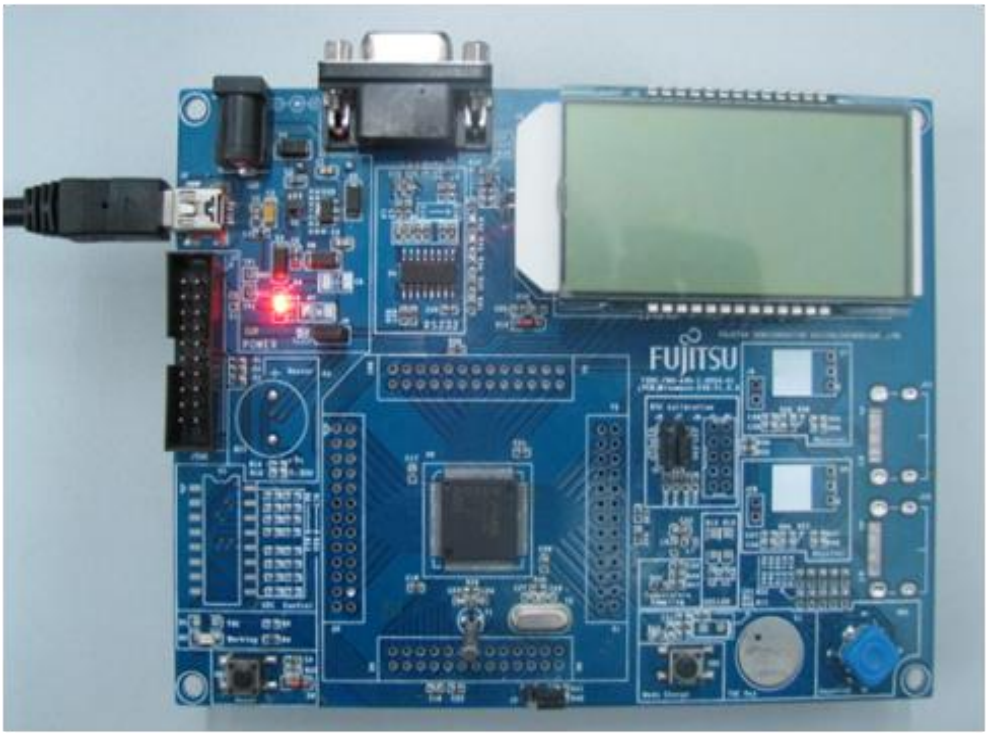

Figure 6-5: Low Power Consumption Mode Display

1. In normal mode, press SW2 + K1 to enter low power consumption mode.
2. Press SW2 will wake up MCU and then enter normal mode.

7 Trouble Shoot

Trouble Shoot

In this section, some probable cause of trouble has been listed, as well as some suggestions.

1. EV board power on, D2 is dark.
   - ✓ Be sure strobe J4.
2. Serial programming can't download firmware.
   - ✓ Be sure strobe J4, J5, selected J6 pin2 and pin3, selected J7 pin2 and pin3.
3. K1 is useless.
   - ✓ When system reset or wake up the MCU from low power consumption mode, don't touch the K1.
   - ✓ If battery power supply, adjustment TSC key sensitivity. Refer to *MCU-UM-510107-E-10-Bluemoon-EVB_FW.docx*
4. Don't exit the test mode.
   - ✓ Be sure the system don't enter low power consumption mode in test mode.
5. The current in low power consumption mode.
   - ✓ See as *chapter 5.4 (Temperature Sample)*.
   - ✓ Don't weld R47, R48, the current only 1.6uA.
6. RTC calibration.
   - ✓ Refer to *MB9AFA32N RTC 校准仪简易使用手册.pdf*
7. Power on, the EV Board does not work.
   - ✓ Be sure does not strobe J5.

8 Additional Information

For more Information on FUJITSU semiconductor products, visit the following websites:

English version address:

http://www.fujitsu.com/cn/fsp/services/mcu/32bit/fm3/an.html

Chinese version address:

http://www.fujitsu.com/cn/fss/services/mcu/32bit/fm3/an.html

9 Appendix

9.1 List of Figures and Tables

Table 3-1: Definition of Connectors on Main Board 8
Table 3-2: Definition of Connectors on Normal Operation 9
Table 3-3: Definition of Connectors on serial programmer 10
Table 3-4: Definition of Connectors on JTAG 11
Table 5-1: Definition of interfaces on Board 18
Table 5-2: Definition of P1 18
Table 5-3: Definition of J1 19
Table 5-4: Definition of J6 19
Table 5-5: Definition of J7 19
Table 5-6: Definition of J8 20

Figure 3-1: System Block Diagram 7
Figure 3-2: Connectors on Main Board 8
Figure 3-3: Connection on Normal Operation 9
Figure 3-4: Connection on Serial Programmer 10
Figure 3-5: Connection on JTAG 11
Figure 4-1: MCU Programmer 12
Figure 4-2: Connect System 12
Figure 4-3: MCU Programmer Download 13
Figure 4-4: JTAG and EVB Connect 14
Figure 4-5: View of Project 15
Figure 4-6: Rebuild the Project 15
Figure 4-7: Download and Debug 16
Figure 4-8: Download completely 16
Figure 5-1: Connectors on Board 17
Figure 5-2: Power Supply 21
Figure 5-3: LCD Display 22
Figure 5-4: temperature sample 23
Figure 5-5: RTC calibration 24
Figure 6-1: Start-up Display 26
Figure 6-2: Display Time 26
Figure 6-3: Display Date 27
Figure 6-4: Test Mode Display 28
Figure 6-5: Low Power Consumption Mode Display 29